First use of an emotional attentional blink task in major depressive disorder

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Cognitive dysfunction in depression

1. Damaging effect on daily life [1]

2. Biomarkers
   - Identify depression subtypes [2]
   - Early marker of treatment response [3]
   - Predict patients who will be refractory to treatment [4]
   - Useful in research (and clinical practice?)

→ New tests
   - More sensitive
   - More precise
Emotion and Attention

- DEMDERA Pilot study
  - Evaluate a range of novel and existing cognitive tasks for comparing MDD patients and controls

- Traditional tests of attention tend to use neutral stimuli

- Attention is affected by emotional valence of stimuli

- Emotional processing is affected in mood disorders [5]

- Is pattern of varying attention for different emotions different in MDD compared to healthy volunteers?
Attentional blink task

- You will see a rapidly-changing series of scrambled faces
- Either 1 or 2 unscrambled faces will appear
- Identify gender of 1st face
- Identify whether 1 or 2 in total
The attentional blink

• Diminished ability to attend to 2\textsuperscript{nd} stimulus (T2) presented within \(\sim500\text{ms}\) (healthy volunteers) of 1\textsuperscript{st} one (T1) [6]
  – Vary interval between faces (160ms or 560ms)

• Easy to alter the emotion of either stimulus and assess whether it affects detection rate of T2
  – Vary emotion of Face 2 (neutral/fear/happy/sad)
  \(\rightarrow\) Assess whether effect of emotion of second face on detection during the attentional blink period differs between groups

Stimuli: KDEF database [7]
Attentional Blink Task

• Fear and anger more easily detected at T2 in controls [8]

• Negative T1 enhances AB in dysphoria [9]

• Not yet done in MDD*

*Literature search of MEDLINE (1946 – May Week 1 2014) for subject headings ‘Depression’ and ‘Attentional Blink’ revealed no such studies.
Aims

1. Pilot study
   - Suitability of tasks for comparing patients and controls
   - Estimates of effect size → Sample size calculations

2. Gather preliminary data to test the hypothesis that...
   - MDD patients demonstrate enhanced detection of negative over neutral faces during the AB period to a greater extent than controls
### Participants

- 10 patients (9 taking antidepressant medication)
- 15 healthy controls

<table>
<thead>
<tr>
<th></th>
<th>Patients (n=10)</th>
<th>Controls (n=15)</th>
<th>T</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>49.1 (11.1)</td>
<td>45.5 (11.1)</td>
<td>0.786</td>
<td>23</td>
<td>0.440</td>
</tr>
<tr>
<td><strong>Gender (F:M)</strong></td>
<td>5:5</td>
<td>11:4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Start time</strong></td>
<td>11:11 (0:30)</td>
<td>10:52 (0:55)</td>
<td>0.986</td>
<td>23</td>
<td>0.335</td>
</tr>
<tr>
<td><strong>IQ</strong></td>
<td>109.2 (13.0)</td>
<td>110.1 (11.1)</td>
<td>-0.179</td>
<td>23</td>
<td>0.859</td>
</tr>
<tr>
<td><strong>MADRS</strong></td>
<td>29.5 (12.0)</td>
<td>0.2 (0.6)</td>
<td>9.507</td>
<td>23</td>
<td>&lt;0.0005</td>
</tr>
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</table>
Suitability and sample sizes

- All participants completed the task
  - 1 patient failed to perform to standard required for analysis → excluded

- No apparent floor or ceiling effect of ABT lag 2 detection

<table>
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<tr>
<th>Effect size</th>
<th>f=0.170</th>
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<tr>
<td>Projected total sample size (number per group); Power 0.8</td>
<td>92 (46)</td>
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Cohen’s d: 0.2=small, 0.5=medium, 0.8=large.
Cohen’s f: 0.1=small, 0.24=medium, 0.4=large.
Results

• No evidence of emotion x lag x group interaction (F(3, 66) = 0.6, p = 0.60)
  – No evidence that the effect of emotion on the AB was altered in depression [10]

• Fear > other emotions in both groups (F(3, 66) = 13.7, p < 0.0005)

• (No overall emotion x lag interaction →) Post-hoc: emotion x lag interaction approached significance in controls (F(3, 42) = 2.4, p = 0.079) but not patients (F(3, 24) = 0.2, p = 0.919)
Discussion

- The duration of the AB may be increased in depressed patients compared to controls
  - Lengthened AB period previously reported in dysphoria [11]

- Limitations
  - Pilot study → Small sample size, preliminary analyses only
  - Fatigue
  - Medication may have masked negative biases in emotional processing
Conclusions and future work

1. ABT is suitable for assessing cognitive dysfunction in MDD
   – Estimated 46 MDD patients and 46 controls for future studies

2. No evidence that impact of emotion on the AB differs between patients and controls, however...
   – Task requires an extra lag condition (~1000ms) to determine if the AB period is longer in MDD
   – Findings warrant investigation in a larger unmedicated sample

• Further: investigate throughout course of illness to determine if deficits on tasks represent state or trait markers of depressive illness
  → Markers of treatment response or underlying susceptibility?
Thank you

Any questions...?

Acknowledgments:
• Hamish McAllister-Williams
• Peter Gallagher
• Tom Smulders
• Kyriaki Foka
• Tom Adams
• Stephanie Clutterbuck
• Andy Hanson
• James Clark
• Chris Smart
• Tamador Elhassan
• Frances Varian
• Zeid Mohammed
References

5. Roiser, Sahakian, *Hot and cold cognition in depression.* CNS Spectrums, 2013

Title picture: BBC; http://tvnz.co.nz/breakfast-news/saturday-november-24-5234366